

high levels of carbon monoxide generated around 5 pm hold on into the evening. This is because air patterns usually stabilize as evening approaches and thus "lock in" the high levels of carbon monoxide associated with the increase in traffic during the late afternoon and early evening hours. Starting around 10 pm, the elevated levels of carbon monoxide start to disperse due to the decrease in traffic. This dispersion continues throughout the night even though atmospheric stability does not break up until later the next morning when surface heating occurs.

The line charts of hourly data in Appendix C are additionally ordered by day of the week. This was done to see if there was any trend in hourly readings that could be attributed to certain days of the week. The line charts indicate that there appears to be no clear pattern of any one day having the highest levels of carbon monoxide; it does appear that, in general, weekday levels are higher than weekend levels.

Appendix D presents continuous time lines for each month of the 1992-93 CO season to further illustrate day the week patterns. However, Appendix D uses the median of each day's hourly readings and not the hourly readings themselves as shown in Appendix C (use of the median instead of the mean will be discussed later). While the information regarding hour-to-hour changes is lost by aggregating the data via a central tendency statistic, the picture concerning possible trends relating to days of the week becomes clearer. Again, it appears that weekday levels of ambient carbon monoxide at these sites are higher than weekend levels (Appendix D has the weekends shaded for ease in comparing weekday and weekend values).

Appendix E contains histograms of frequency distributions that were generated for the Raleigh Crabtree Valley site for November 1992 (histograms were done for all the stations selected for analyses, but only one is illustrated). Note that the distributions represent hourly data for the first day of the month and every ten days afterward. Located to the right of each histogram there is a frequency distribution of the same data, but with a logarithmic transformation. This is a common method of manipulating skewed data so it will approximately fit a normal curve. Also shown are computer generated overlays of estimated normal distributions with the same mean and standard distribution as the data used to calculate the histograms.

Appendix E demonstrates that neither the frequency distributions of the raw data nor their logarithmic transformation result in normal distribution curves. While there is no clear pattern to the distribution of data for each of the days analyzed, it appears that the data are somewhat skewed to the right, but not uniformly enough to produce a normal curve by performing a logarithmic transformation as one might do when working with lognormal distributions. This indicates that the distribution of the data that generated the curves is not a product of consistent, systematic processes.

After reviewing the frequency distributions discussed above, it was decided that parametric statistics would not be suitable for analyzing the data and that nonparametric statistics would be more appropriate. One nonparametric method that has been widely used with environmental data is the box plot. This procedure produces a visual representation of various order statistics (commonly used percentiles) as well as calculated confidence intervals about a central tendency statistic (in this case the median, or the 50th percentile). Box plots can also be used for visual hypothesis testing, yielding basically the same results as when using formal tests for multiple independent datasets, such as the Kruskal-Wallis Test. For a description on how to interpret box plots see Appendix G.

EVALUATION OF AMBIENT CARBON MONOXIDE DATA FROM THE SUBSET OF SAMPLING SITES

Use of time lines to informally detect trends in the data was extended from the previous hourly, daily, and weekly analyses to month-by-month reviews of ambient carbon monoxide levels. Appendix F contains time lines for each of the subset of stations shown in Appendix A.3. The information depicted in Appendix F is delineated by month over annual CO season, beginning in the winter of 1989. The median and maximum for each station's daily hourly readings were calculated and plotted on a line chart.

Review of the time lines for each station revealed the following observations:

- in general, there appears to be a slight decrease in median values in each succeeding year
- there is a definite overall reduction in the maximum values each succeeding year, with the greatest reduction occurring in the 1992-93 CO season